REMARKS

By the above amendment, Applicant has amended the specification to clarify the novelty of the invention.

Also Applicant has amended 7 of the 17 claims to define the inventions more particularly and distinctly so as to overcome the technical rejections and define the invention patentably over the prior art.

The Objection to the Specification' Informalities

The specification was objected to since its definition of "cube" was said to be unclear.

Applicant requests reconsideration and withdrawal of this objection since "cube" is taught clearly in the specification (the first full paragraph on page 6) though it is not necessary to teach prior art. Specifically, "The count of points in a cube must be 1, 2, 4, or any other power of 2" in the specification (the first full paragraph on page 6) clarifies that a cube can include multiple points. The specification is amended on page 6 to state more clearly that "cube" is well known in prior art.

The definition of the term "cube" in the specification (the first full paragraph on page 6) matches the detailed definition of "cube" found in the art (Simpson). Specifically, the "cube" is intended to include multiple points or vertices. This inclusion is intuitive because a physical cube in daily life has multiple corners. This inclusion is clear in Simpson's definition because the phrases "a cube of vertices" and "the vertices covered by each cube" are used by Simpson at Column 13, line 35 and lines 39-40, respectively. This inclusion is also shown explicitly by Simpson with the 4 example cubes in Table 2 at Column 13: The first cube 0010 represents a single minterm (a lattice point or a vertex according to Column 13, lines 32-33), and each of the next 2 cubes, 1X0X and XXXX, is clearly marked in this table as representing multiple minterms (lattice points or vertices). The last cube N, including no minterms, is irrelevant to this specification because it cannot occur for the reason stated in the bottom paragraph on page 7.

The value "X" in Simpson's definition corresponds to input variables that are completely free to take any values in the specification (the first full paragraph on page 6). According to Column 13 line 29 and lines 31-32, Simpson's variable can only take 2 values, 0 or 1. As known in the art and as shown by Simpson at Column 13 lines 37-38 and Table 2, the value "X" represents the freedom for a variable to take either value. The specification is amended on page 6 to clarify that variables are free to take any values if they are not substituted with either Boolean constant following a cube as the given subset of the input space.

Accordingly applicant submits that the specification's definition of the term "cube" is clear and therefore requests withdrawal of this objection.

The Claims Rejection Under 35 USC §112, First and Second Paragraphs

Claims 1-17 were rejected under 35 U.S.C. 112, first and second paragraphs since the specification was said to fail to sufficiently describe the term "cube".

Applicant requests reconsideration and withdraw of this rejection because of the following reasons:

(1) **The term "cube" is well known in the art** as consistently described by Simpson and by the amended specification.

(2) The term "cube" refers to a set of points where only some of the input variables are substituted with constants but **other input variables may remain undefined**. This is clearly described in the specification and more clearly in the amended specification (the first full paragraph on page 6). This is also clearly described by Simpson that each X represents an undefined variable (Column 13, lines 37-38 and Table 2). X clearly is not a constant because 0 and 1 are the only two constants (Column 13, line 29 and lines 31-32).

(3) The descriptions of **FIG. 1** (the last paragraph on page 6) and **FIG. 2** (the last paragraph on page 8) are amended to clarify that **the key role of the cube is**

to provide the substitution requirements to steps **120** and **220**. The corresponding parts of the claims are also amended accordingly.

(4) **The word "definition" is changed to "substitution requirements"** in the claims and in the specification to emphasize the operational semantics.

Accordingly applicant submits that claims 1-17 are allowable and solicits reconsideration and allowance.

The Claims Rejection Under 35 USC §112, Second Paragraph

Claims 7-17 were rejected under 35 U.S.C. 112, second paragraph since it was said to be not clear how a subset of a Boolean input space may be represented by a "range" of binary integers.

Applicant requests reconsideration and withdraw of this rejection because of the following reasons:

(1) **It may not be possible** to represent certain subset of a Boolean input space as a single range of binary integers. Two paragraphs on page 10 are amended to more clearly describe that the range representation can be used only when it is possible so.

(2) The second full paragraph on page 10 clearly states that any subset of a Boolean input space may be represented as **one or more ranges of binary**

integers. At least, if each range includes only one binary integer, any subset of a Boolean input space may be represented as a union of such ranges.

(3) The second full paragraph on page 12 has been amended to more clearly describe the method with **possibly representing the given subset as multiple ranges**.

(4) It is **frequently possible** to represent a subset of a Boolean input space as a range of binary integers. The entire N-dimensional Boolean input space can always be represented as the range of all N-bit binary integers, as stated in the amended last paragraph on page 10. Any part of a range is always a range in this method.

(5) **The phrase "represented by"** is changed to "represented as" in the claims to be consistent with the specification.

Accordingly applicant submits that claims 7-17 are allowable and solicits reconsideration and allowance.

The Rejection of 9 Claims Under 35 USC §103(a)

Claims 1, 4-8, 11-12, and 17 were rejected under 35 U.S.C. 103(a) over Okuzawa in view of Tucker and MPEP 2144.04(VI)(B) legal precedent for duplication.

Applicant requests reconsideration and withdraw of this rejection because of the following reasons (in addition to the dependent claim's dependency to the base claim and any intervening claims):

(1) **Okuzawa and this method solve different problems**. Okuzawa always requires UPPER LEVEL LOGIC and LOWER LEVEL LOGIC as disclosed in FIG. 1 (column 4, lines 33-36). However, this method takes 3 elements: a Boolean function, a Boolean constant and a subset of input space, and no 2 of these 3 elements play parallel roles as UPPER LEVEL LOGIC and LOWER LEVEL LOGIC do.

(2) **Okuzawa's COMPARISON in FIG. 1 is not related to anything in this method**. As disclosed at column 4, lines 49-51 and at column 8, lines 37-44, Okuzawa's COMPARISON in FIG. 1 compares 2 BDDs from the BDD simplification portion. However, this method does not handle BDDs at all. As disclosed in the amended first full paragraph on page 3, it often fails to build BDDs and this method tries to avoid such disadvantage.

(3) **The problems solved by Tucker's divide-and-conquer are also different.** Tucker's divide-and-conquer is about parallel algorithmic techniques and parallel functional programming. It does not disclose anything related to Boolean functions, Boolean constants, subsets of input space, Boolean expressions, logic circuits or truth tables. Okuzawa and this method do not depend on any parallel algorithm techniques or parallel functional programming.

(4) **This method does not involve any mere duplication of anything as in MPEP 2144.04(VI)(B)**. The dividing step in claim 1 transforms a hard problem into ones easier to solve because it can have better (new and unexpected) chances to get from step 130 to step 140 in FIG. 1 or from step 230 to step 250 in FIG. 2. The process can end (as the new and unexpected result) without solving any remaining easier problems if it also gets from step 140 to step 190 or from step 250 to step 260. As disclosed in the last paragraph on page 7, it takes only limited rounds of this dividing step to completely solve the problem so that each step gets closer (newly and unexpectedly) to the end. Among other differences, each of these easier problems after the simplifying step can take less memory than the hard problem so that it has lower probability to run out of memory.

(5) **None of the references suggested any connection between Okuzawa and Tucker or MPEP 2144.04(VI)(B)**. It is never obvious how to combine ideas from different fields.

(6) **Okuzawa's SIMPLIFICATION in FIG. 1 is not related to anything in this method**. As disclosed at column 4, lines 49-51 and FIG. 3 and FIG. 4, Okuzawa's SIMPLIFICATION in FIG. 1 simplifies BDDs for the BDD comparison part. However, this method does not handle BDDs at all. As disclosed in the amended first full paragraph on page 3, it often fails to build BDDs and this method tries to avoid such disadvantage.

(7) **Okuzawa's LOGIC CIRCUIT TRUTH TABLE BOOLEAN EXPRESSION in FIG. 1 is not related to a range of binary integers**. Sometimes it is

impossible to represent certain logic circuit, truth table or Boolean expression as a range of binary integers.

Accordingly applicant submits that claims 1, 4-8, 11-12, and 17 are allowable and solicits reconsideration and allowance.

The Rejection of 3 Claims Under 35 USC §103(a)

Claims 2-3, and 16 were rejected under 35 U.S.C. 103(a) over Okuzawa in view of Tucker and MPEP 2144.04(VI)(B) legal precedent for duplication and Simpson.

Applicant requests reconsideration and withdraw of this rejection because of the following reasons (in addition to the dependent claim's dependency to the base claim and any intervening claims):

(1) **Simpson's cube is used to solve a different problem**. It is about making special hardware dedicated to solving a given problem. However, Okuzawa, Tucker and this method are about using general-purpose conventional computer to solve different kinds of problems. Okuzawa and this method only generate yes/no answers while Simpson generates processing details of making some special hardware.

(2) **Simpson teaches away** from using conventional computer at column 4, lines 48-54.

(3) **None of the references suggested any connection between Simpson, Okuzawa and Tucker or MPEP 2144.04(VI)(B).** It is never obvious how to combine ideas from so many different fields.

Accordingly applicant submits that claims 2-3, and 16 are allowable and solicits reconsideration and allowance.

The Rejection of 5 Claims Under 35 USC §103(a)

Claims 9-10 and 13-15 were rejected under 35 U.S.C. 103(a) over Okuzawa in view of Tucker and MPEP 2144.04(VI)(B) legal precedent for duplication and further in view of MPEP 2144.04(VI)(A) legal precedent for changing size/proportion.

Applicant requests reconsideration and withdraw of this rejection because of the following reasons (in addition to the dependent claim's dependency to the base claim and any intervening claims):

(1) **The problems solved by Tucker's divide-and-conquer are also different.** Tucker's divide-and-conquer is about parallel algorithmic techniques and parallel functional programming. It does not disclose anything related to Boolean functions, Boolean constants, subsets of input space, Boolean expressions, logic circuits or truth tables. Okuzawa and this method do not depend on any parallel algorithm techniques or parallel functional programming.

(2) **This method does not involve mere scaling up of a prior art process capable of being scaled up as in MPEP 2144.04(VI)(A).** The dividing, replacing and shifting steps transform a hard problem into ones easier to solve because of the better chances to get from step 130 to step 140 in FIG. 1 or from step 230 to step 250 in FIG. 2. The process can end without solving any remaining easier problems if it gets from step 140 to step 190 or from step 250 to step 260. As disclosed in the last paragraph on page 7, it takes only limited rounds of these steps to completely solve the problem so that each step gets closer to the end. Among other differences, each easier problem can take less memory than the hard problem after the simplifying step. The process to solve the hard problem (or any of the easier problems) is not a prior art process because it is not similar to Okuzawa (using BDDs) or Tucker (parallel algorithmic techniques or parallel functional programming) or any other references or any of their possible combinations.

(3) **None of the references suggested any connection between Okuzawa and Tucker or MPEP 2144.04(VI).** It is never obvious how to combine ideas from different fields.

Accordingly applicant submits that claims 9-10 and 13-15 are allowable and solicits reconsideration and allowance.

Conclusion

For all of the above reasons, applicant submits that the specification and claims are now in proper form, and that the claims all define patentably over the prior art. Therefore he submits that this application is now in condition for allowance, which action he respectfully solicits.

Conditional Request For Constructive Assistance

Applicant has amended the specification and claims of this application so that they are proper, definite, and define novel structure which is also unobvious. If, for any reason, this application is not believed to be in full condition for allowance, applicant respectfully requests the constructive assistance and suggestions of the Examiner pursuant to M.P.E.P. § 706.03(d) and § 707.07(j) in order that the undersigned can place this application to allowable condition as soon as possible and without the need for further proceedings.

Very respectfully,

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I certify that on the date below I will fax this communication to Group 2123 of the Patent and Trademark Office at the following number: (703)746-7239

Date: October 19, 2003

Inventor's Signature: